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Optimal Size of Government and Economic Growth in Malaysia: Empirical Evidence

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ABSTRACT

An increased integration of the world economy over the last few decades has led to growing interest in its effects on different aspects of national economies. One aspect that has drawn particular attention is the effect on government spending. However, the relation between government size and economic growth is ambiguous. There are persuasive arguments for both positive and negative impacts on economic growth. This paper aims to test long run relation between government size and economic growth. Specifically, it test whether there is an “inverted U" shape relationship between public spending and economic growth or not and to find the optimal level of government size in Malaysia. It is important to measure the optimal level of government size to ensure its play an efficient role in the economy. Using the autoregressive distributed lag (ARDL) bound testing approach, the result shows that goverment size in Malaysia is not exceed the optimal level. Based on the results of the study, an economic policy proposal may be that the share of public expenditureand the effectiveness of public expenditure programs should be increased to foster economic growth in Malaysia.

Keywords: Optimal Government Expenditure, Economic Growth, ARDL Bounds Testing Approach

INTRODUCTION

An increased integration of the world economy over the last few decades has led to growing interest in its effects on different aspects of national economies. One aspect that has drawn particular attention is the effect on government spending.The role of government size in the economy has been debated in economic theory for a long time. However, the relation between government size and economic growth is ambiguous. There are persuasive arguments for both positive and negative impacts on economic growth. The government size could affect economic growth positively by providing the facilities and infrastructures and by solving the problem such as the market failure in the economy. On the other hand, there is also the argument which states a negative relation between government size and economic growth. It happens through inefficiency of government in the economy as well as the excess burden that have to be faced by the government. It shows that over-expanding on the government size will will affect the productivity in the economy.

This study will analyse the long run relationship between government expenditure and rate of economic growth for Malaysia by using the data for the period 1970-2012. The main purpose of this study is to test whether there is an “inverted U" shape relationship between public spending and economic growth or not and to find the optimal level of public spending inMalaysia.The remaining of the paper is organized as follows: Section 2 provides a short literature relating to the relationship between government spending and economic growth, Section 3 describe the sources of the data that has been collected and also presents the econometric methodology by focusing on definitions of the government size variables and econometric modelling. Section 4 presents the empirical results and followed by conclusion.

LITERATURE REVIEW

There are two opinions regarding the role of government size in the economy. Some argues that government plays an important role to foster economic growth. They argue that the participation of government in the economy helps to correct short term cyclical fluctuations in aggregate expenditure as well as providing the facilities to the private sector to do more investment. In other words, the participation of government in the economy gives a positive effect on both productivity and growth. It is supported empirically by Ram (1986) who finds that there exists a positive relationship between government expenditure and economic growth. On the other hand, some views that the government affects the economy negatively for example Folster and Henrekson (2001).

Barro (1990) proposes the endogenous growth model where government size can permanently change a country's long run rate of economic growth given the absence of diminishing returns to capital. This model assumes all government spending is implicitly productive. Besides, government size is assumed to complement private inputs and it is included in the production function. The model determines that government size plays a vital role in economic growth via its impact on the rate of technological change. The endogenous growth model has been expanded by allowing different kinds of government expenditures to have different impacts on growth. It can be seen for examples in Lee (1992), Devarajan et al. (1996) and Kneller et al. (1999).

A number of studies have tested for the influence of government activity on economic growth assuming that an inverted-U relationship exists between the scale of government and economic growth For examples Ram (1986), Dar & Amir Khalkhali (2002) and Altunc and Aydın (2013)**.** The existence of an "inverted U" relationship between economic growth and the share of the public sector may be analysed via the Armey curve. The Armey curve states that there is a positive correlation between public expenditure and GDP. After certain point (optimal level) the correlation becomes negative. Additional increase in public expenditure will only mean its inefficiency in the economy

Majority of empirical analyses such asRomer (1986), Barro (1990, 1991), Landau (1983, 1986) and Sala-i-Martin (1997) used cross-section analysis to link measures of government spending with economic growth rates and produced mixed evidence; the most common results show that government expenditure is detrimental to economic growth. However, cross-country growth regressions do not capture the dynamics of the relationship between these two variables and disregard country-specific factors

Empirical studies carried out on the basis of the Armey curve (Pevcin, 2004; Mavrov, 2007; Facchini and Melki, 2011; Vaziri et al., 2011) reveal that the optimal level of public expenditure is between the threshold values expressed by Friedman. The majority of the researchers who attempt to predict the optimal share of the public (in a manner which would maximize economic growth) are using the theoretical framework of Barro (1989). According to this principle by Barro, the optimal level of public expenditure is obtained when the marginal productivity value equals 1. Building upon the Barro model, Karras (1997) has developed an empirical methodology to examine the role of public expenditure in the process of economic growth. That study, focusing on the Barro principle in 20 European countries, has calculated the optimal share of the public to be 16% .

DATA AND METHODOLOGY

This study employs annual data from 1970 to 2012 for Malaysia and all variables are generated from the World Bank Database (2013). Since this study use time series data, we need to ensure that series is non-stationary data by applying Augmented Dickey Fuller (ADF) test for unit root.

The theoretical framework discussed in this study is premised on the endogenousgrowth theory which analyses the nature of the relationship between fiscal policyvariables and economic growth in the Malaysia economy. In line with this, the relationshipbetween output in the economy and the augmented variables to be used for thisstudy are specified in a general form by equation (1) below:

$$lny = f(gexp, top) \tag{1}$$

where*y* is Gross Domestic Product (GDP); *gexpis*general government final consumption expenditure (% of GDP) as proxy for government size; and *top*is trade openness (sum of import and export / GDP).

To test whether there is an "inverted U" shape relationship between public spending and economic growth or not, we will adopt the Armey curve which demonstrates a non-linear relationship between public expenditure and economic growth. The regression equation which will be used in this study is as follows:

$$lny_t = \beta_0 + \beta_1 gexp_t + \beta_3 gexp_t^2 + \beta_4 top_t \qquad \beta_3 < 0 \qquad (2)$$

The Autoregressive Distributed Lag (ARDL) bound testing approach will be adopted to investigate the non-linear relationship between government expenditure and economic growth in Malaysia. ARDL method proposed by Pesaran et al. (2001) allows to test a long run relationship between variables of mixed order of integration. Hence**,** the ARDL Bound Cointegration test model:

$$\Delta lny_t = \beta_0 + \beta_1 lny_{t-1} + \beta_2 gexp_{t-1} + \beta_3 gexp_{t-1}^2 + \beta_4 top_{t-1} + \sum_{i=1}^{p} \alpha_{1i}\, \Delta lny_{t-i} + \sum_{i=0}^{p} \alpha_{2i}\, \Delta gexp_{t-i} + \sum_{i=0}^{p} \alpha_{3i}\, \Delta gexp_{t-1}^2 + \sum_{i=0}^{p} \alpha_{4i}\, \Delta top_{t-i} + \varepsilon_t \qquad (3)$$

where *y* is Gross Domestic Product (GDP); *gexp* is government size; $gexp^2$ issquares of government size; *top* is trade openness; Δ denotes a first difference operator; ln represents natural logarithmic transformation; β_0 is an intercept and ε_t is a white noise error term.

There are two steps in testing the cointegration relationship between output, trade openness and government expenditure. First, the Equation (2) is estimated by OLS technique. Second, the null hypothesis of no-cointegration $H_0 = \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$ is tested against the alternative of $H_0 \neq \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq 0$ by the means of *F*-test. Since the sample size used in this study is relatively small, we utilize the *F*-statistics for critical value bounds that are generated by Nayaran (2005).

If the computed *F*-statistic falls below the lower bound critical value, the null hypothesis of no-cointegration cannot be rejected. In contrast, the null hypothesis is rejected if the computed *F*-statistic lies above the upper bound critical value. This implies existence of a long-run cointegration relationship amongst the variables in the model. Nevertheless, if the calculated value falls within the bounds, inference is inconclusive.

In order to calculate the optimal government expenditure which will maximize economic growth, the following equation is to be used (Altunc & Aydın, 2013):

$$\text{Optimal expenditure (EXP)} = -\frac{\beta_1}{2(\beta_2)} \qquad (4)$$

In this study, the maximum lag length of one is chosen in ARDL model because of the annual data and limited observations. Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion (SBC) criteria will be used to select the optimum lag of the ARDL level relation model.To ascertain the goodness of fit of the ARDL model, diagnostic and stability tests are conducted by employing the Jarque-Bera statistic for testing normality, Lagrange Multiplier for serial correlation test; ARCH for heteroscedasticity test; Ramsey RESET for specification test and finally stability test via cumulative residuals (CUSUM) and the cumulative sum of squares of recursive residuals ($CUSUM^2$).

RESULTS AND DISCUSSIONS

First, we conduct a times series unit root test prior to running the cointegration analysis of the data. We adopt the Augmented Dickey-Fuller (ADF) test for unit root. Table 1 shows the statistics from the times series unit root tests. The variables are labelled as lny for GDP, $gexp$ for government size and top for trade openness. The test statistics suggest that only $gexp$ variables are stationary while the rest of the variable are non-stationary at level. However, all variables are stationary at first-difference as all unit root tests reject the null hypothesis of non-stationarity at one per cent level of significance.

Since some of the series are stationary at level I(0) and some of the series are stationary at first difference level I(1), the Autoregressive Distributed Lag (ARDL) bound testing will be suitable approach to investigate the non-linear relationship between government expenditure and economic growth in Malaysia.

The results for the computed Wald test (F-statistics) reported in Table 2 reveals that the calculated F-statistics of 4.714 is higher than the upper bound critical value of 4.544 at 5% level. Based on this result, we conclude that a level long run cointegration relationship exists for the estimated ARDL models. Thus, the null hypotheses of no cointegrationcannot be accepted, implying long-run cointegration relationships amongst the variables when the regressions are normalized on GDP.

Table 3 reports the result of the long run coefficients. The results show that coefficients for all variables have the correct signs as predicted by theory and hypothesis. These results indicatethat $gexp$, $gexp^2$ and top were statistically significant in influencing lny at the 1% level of significance. Both government size variables $gexp$ and $gexp^2$ are significant and have the correct signs (according to Armey curve) confirming the hypothesized inverted U-shape of government size impact on economic growth. Results indicate that the Armey Curve exists in Malaysia. Very high government sizes led to give negative effect to economic growth while moderate government sizes led to affect economic growth positively.. Optimum lag of the ARDL level relation model selection based on Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion (SBC) are reported in Appendix (figure 1)

Table 4 reports the result of the short-run dynamic coefficients with the diagnostic and stability tests**.** The signs of the short-run dynamic impacts are maintained to the long-run except for the trade openness (top). However, $gexp$ is only significant at 5% levels. The estimatedcoefficient for the error correction term reveals which of the variables adjust to correct imbalance in the growth situation whilst the variable coefficients show the short-run effects of the changes in the explanatory variables on the dependent variable. The results confirm that economic growth in Malaysia has an automatic mechanism which responds to deviations from equilibrium in a balancing manner. The speed of adjustment of the error-correction process shows negative values (-0.142) and statistically significant.

We also can conclude that the model is fit where it has passes all the diagnostic tests against normality, serial correlation, heteroscedasticity, functional form misspecificationand stability test at 5% significant level. From the table 4, JB is the Jarque-Bera statistic for testing normality. AR(2) and AR(4) is the serial correlation Lagrange Multiplier test for lag 2 and lag 4, respectively. ARCH(1) is the 1st order heteroscedasticitytest for ARCH. RESET refers to Ramsey RESET specification test.$CUSUM$and$CUSUM^2$ are the cumulative sum of recursive residuals stability test and cumulative sum of squares of recursive residuals stability test, respectively.

According to Pesaran and Shin (1999), the stability of the estimated coefficient of the error correction model should also be graphically investigated. A graphical representation of the Cumulative Sum ($CUSUM$) and the Cumulative Sum of Square ($CUSUM^2$) of the Recursive Residual are also established. The cumulative sum ($CUSUM$) and cumulative sum of squares ($CUSUM^2$) plots which is shown in appendices from a recursive estimation of the model also indicate stability in the coefficients over the sample period.

Instead of investigate long-run and short-run relationship between government expenditure and economic growth, this study also aim to find the optimal level of government expenditure for Malaysia. Based on the Long-Run coefficient that we get from table 3, we can calculated optimal government expenditure for Malaysia as follows:

Optimal government expenditure $= -\frac{1.992}{2(-0.061)}$

The optimal government size based on maximizing economicgrowth, was determined as 16.32 per cent and current level of government expenditure (% of gdp) in 2012 is still lower than the calculated optimal government size. This finding can be summarises based on table 5

CONCLUSION

This study has analysed the relationship between government expenditure and rate of economic growth for Malaysia by using the data for the period 1970-2012. The main purpose of this study is to test whether there is an “inverted U" shape relationship between public spending and economic growth or not, and to find the optimal level of public spending for Malaysia. This studies has identified the presence of “inverted U” (non-linear Armey curve) relationship between government size and economic growth in Malaysia. The results of the study suggest an optimal government expenditure percentage of approximately 16.32% and current level of government expenditure (% of gdp) in 2012 is still lower than the optimal government size. Based on the results of the study, an economic policy proposal may be that the share of public expenditureand the effectiveness of public expenditure programs should be increased to foster economic growth in Malaysia.

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APPENDIX

FIGURE 1: ARDL Models With Different Lag Structure Based On AIC And SBC Selection Criteria.

Model	ARDL	AIC	SBC
1	(1,0,0,0)	-1.502713	-1.295847

2	(1,1,0,0)	-1.668016	-1.419777
3	(1,1,1,0)	-1.620740	-1.331128
4	(1,1,1,1)	-1.735054	-1.404069
5	(1,0,1,0)	-1.665204	-1.416966
6	(1,0,1,1)	-1.736482	-1.446870
7	**(1,1,0,1)**	**-1.766388**	**-1.476777**
8	(1,0,0,1)	-1.495348	-1.247109

Notes: the minimum AIC and SBC is ARDL level model with lag (1,1,0,1)

FIGURE 2: Cumulative Sum Of Recursive Residuals Stability Test (Cusum)

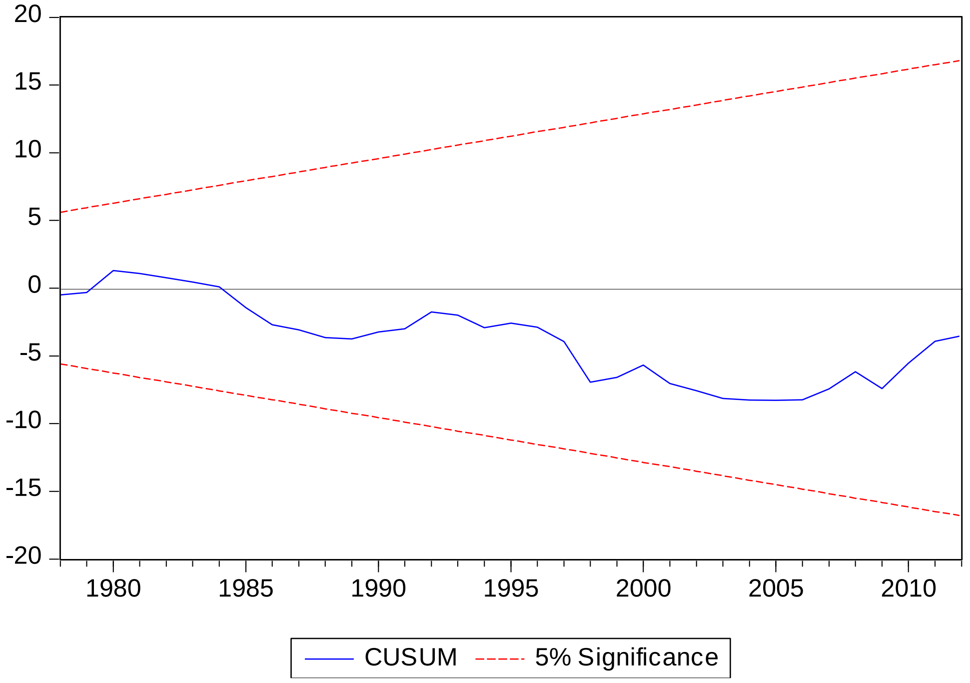

FIGURE 3: Cumulative Sum Of Squares Of Recursive Residuals Stability Test ($CUSUM^2$)

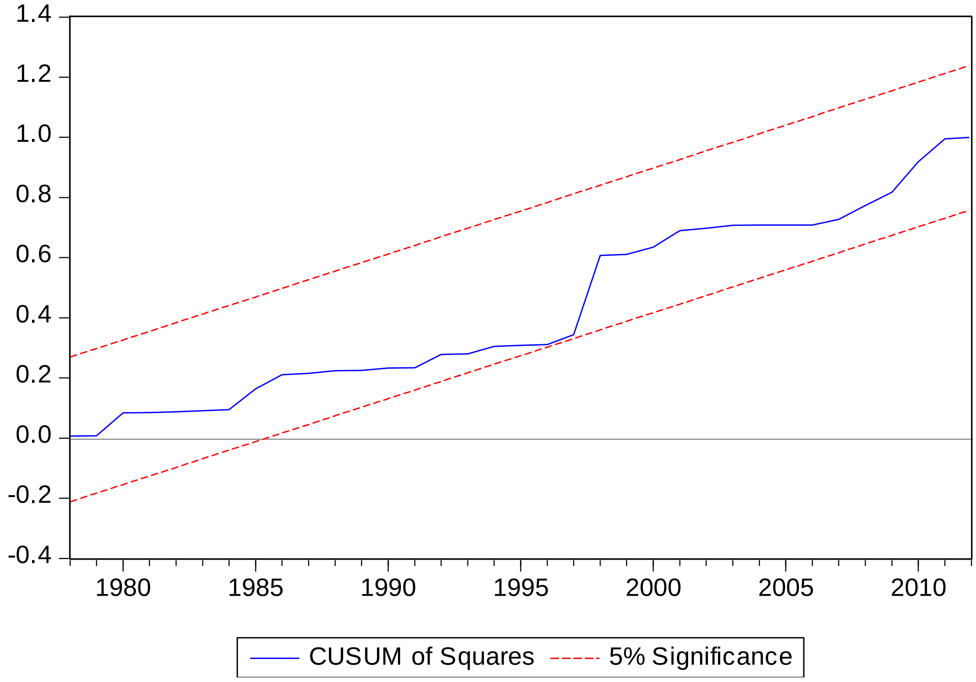

TABLE 1: Augmented Dickey Fuller (ADF) Unit root test

	Model A (Intercept)	Model B (Intercept with trend)	Model C (None)
		LEVEL	
lny	-1.694 (0.426)	-2.655 (0.259)	5.389 (1.000)
gexp	-2.077 (0.254)	-3.242*** (0.090)	-0.504 (0.492)
top	-1.506 (0.520)	0.210 (0.997)	0.494 (0.817)
		FIRST DIFFERENT	
lny	-5.170*** (0.000)	-5.314*** (0.000)	-3.484*** (0.000)
gexp	-4.592*** (0.000)	-4.630*** (0.003)	-4.603*** (0.000)
top	-4.677*** (0.000)	-4.934*** (0.001)	-4.560*** (0.000)

Note: (*),(**),(***) denotes statistical significance at the 10%, 5% and 1% levels respectively. Figures in parentheses are P-value

TABLE 2: ARDL Bound Test Result

Computed F-Statistic	**4.714**
1% critical bound value	I(0): 4.428, I(1): 6.250
5% critical bound value	I(0): 3.202, I(1): 4.544
10% critical bound value	I(0): 2.660, I(1): 3.838

Notes: Critical values are extracted from Narayan (2005); Unrestricted Intercept and No Trend (Case III)

TABLE 3: Estimated Long Run Coefficients Using TheARDL Approach

Variable	*Coefficient*	*Std. Error*	*t-ratio*	*p-value*
$constant$	5.985	5.032	1.189	0.242
$gexp$	1.992***	0.612	3.251	0.003
$gexp^2$	- 0.061***	0.020	-3.029	0.005
top	5.9858***	0.599	4.943	0.000

Notes: Dependent variable is lny. (*), (**) and (***) indicate significant at 10%, 5% and 1% significance level respectively. ARDL (p,q,r,s) lag for each variable is selected based on AIC

TABLE 4: Error Correction Representation For The ARDL (1,1,0,1) And Diagnostic Check

Short-run Elasticity:	**Coefficient**	**Std. Error**	**t-ratio**	**p-value**
ECT_{t-1}	-0.1426***	0.0351	-4.054	0.000
$\Delta(gexp)$	0.2342**	0.0898	2.608	0.013
$\Delta(gexp^2)$	-0.0088***	0.0030	-2.915	0.006
$\Delta(top)$	-0.0062	0.1534	-0.040	0.968
$\Delta(constant)$	0.8535	0.8333	1.024	0.313
Diagnostic Check				
JB	0.9988 (0.6068)			
AR**(2)**	0.2340 (0.7926)			
AR**(4)**	0.1628 (0.9296)			
$ARCH$**(1)**	0.1224 (0.7201)			
$RESET(1)$	1.337918 (0.2555)			
$CUSUM$	stable			
$CUSUM^2$	stable			

Notes: Dependent variable is $\Delta(lny)$. (*), (**) and (***) indicate significant at 10%, 5% and 1% significance level respectively. Figures in parentheses are p-value.

TABLE 5: The relationship between Economic Growth and Government Total Expenditure (1970-2012)

Optimal level of expenditure (GDP%)	**Government expenditure on 2012(% of GDP)**	**Armey curve exist?**
16.32	13.51	yes